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Gender HCI Issues in Problem-Solving Software

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A New Research Area: End-User Software Engineering

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Is it possible to bring the benefits of rigorous software engineering methodologies to end users?

Outreach & Building Community

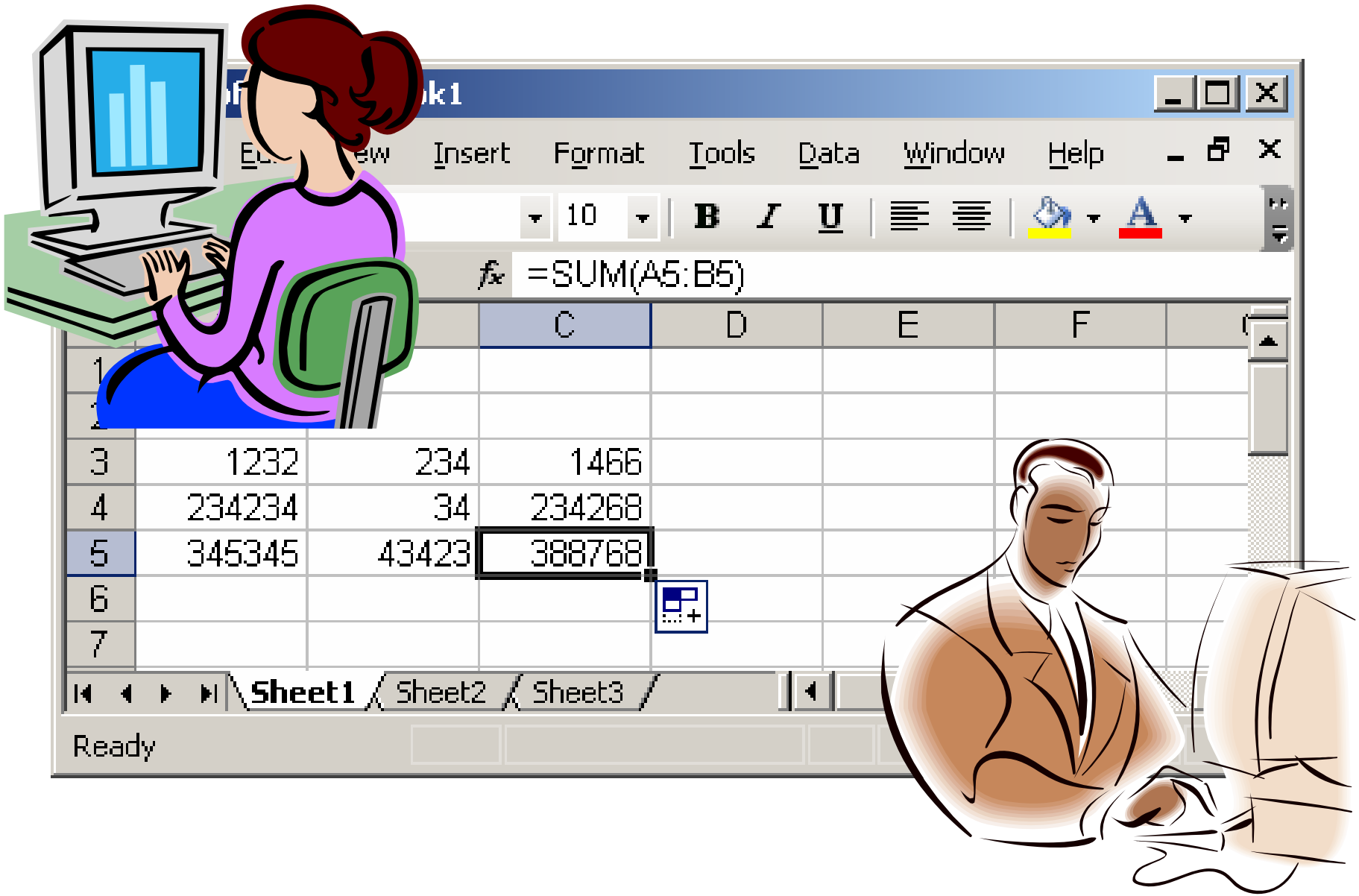
K-12 education: quality control mindset

- Research in curriculum change
- Mathematics education conferences, book
- K-12 teachers
- K-12 students (Saturday Academy)
- High school researchers

Building research community

- Public bibs, many talks, many papers.
- Community-building events: SIGs, Spreadsheet workshop, Educ. workshops, WEUSE I, WEUSE II. (More to come...)

Gender Differences??



So What?

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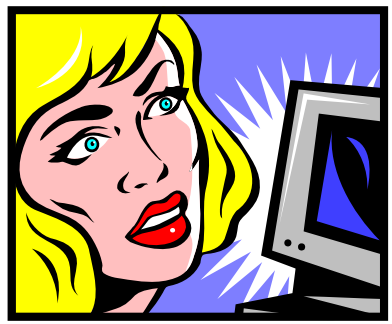
Pipeline:

- Unsuccessful early experiences with software will not lead to computing careers.

Success:

- Limiting experiences with software impose yet another barrier to success.



Activities and Research Paradigm

1. Derive hypotheses from theories.
   - Gender differences + software features.
2. Refine/test hypotheses empirically.
3. Use results to redesign prototype.
4. Evaluate empirically, iterate.

Results to Discuss Today

Self-efficacy – an individual's belief in their ability to complete a specific task

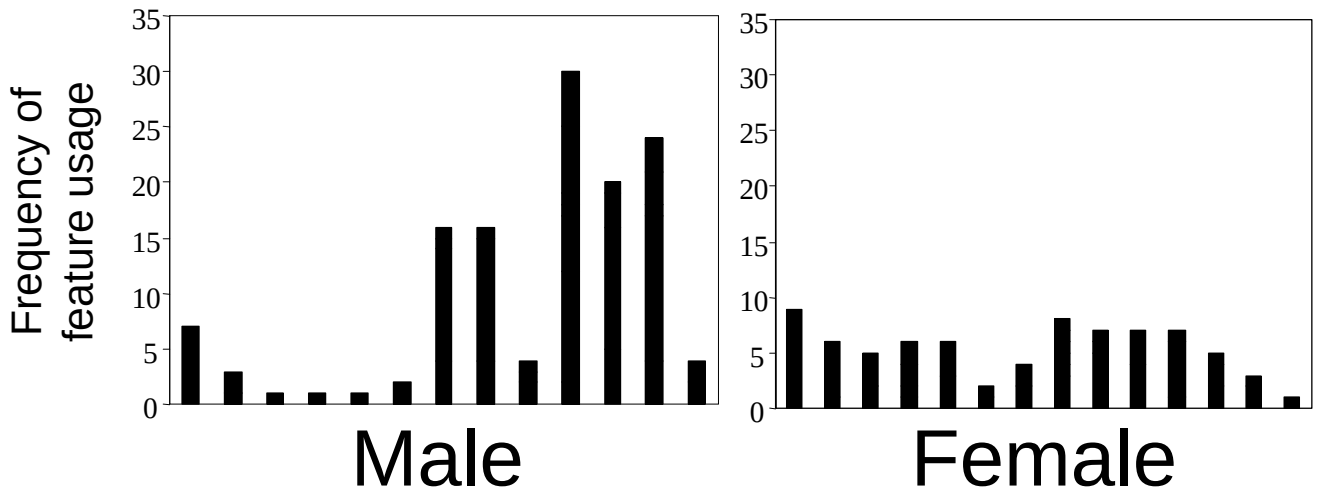
1. Self efficacy (CHI'05).
2. Specific relationships of SE+gender to software features (CHI'05).
3. Ties to tinkering (CHI'06).

Feature Acceptance

Types of acceptance

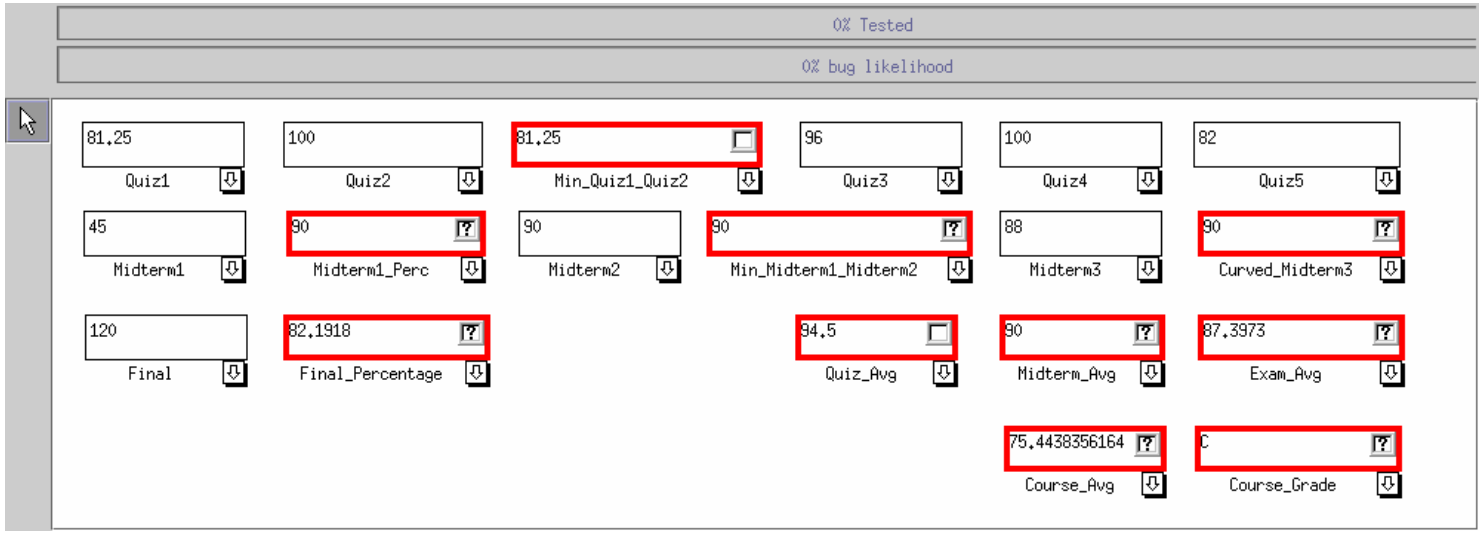
- Willingness to approach.
- Willingness to adopt.

Early qualitative evidence – Activity Patterns



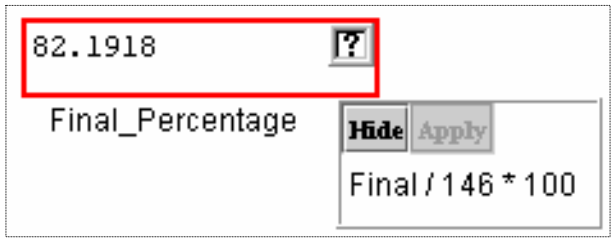
Experiment

End-user problem solving setting



Task: Find and Fix Bugs

Experiment – Features



Type familiar: formula edits.

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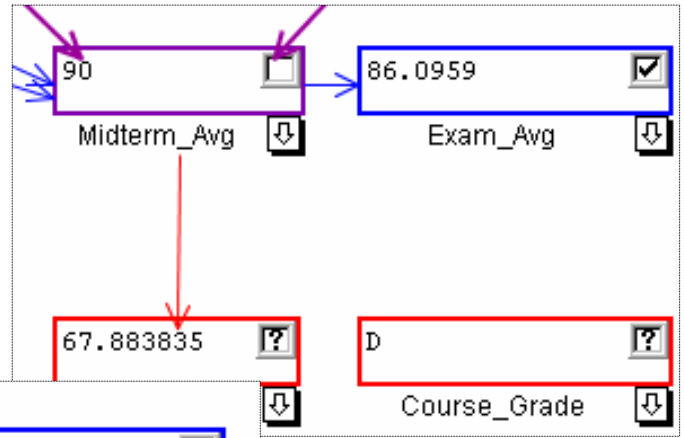
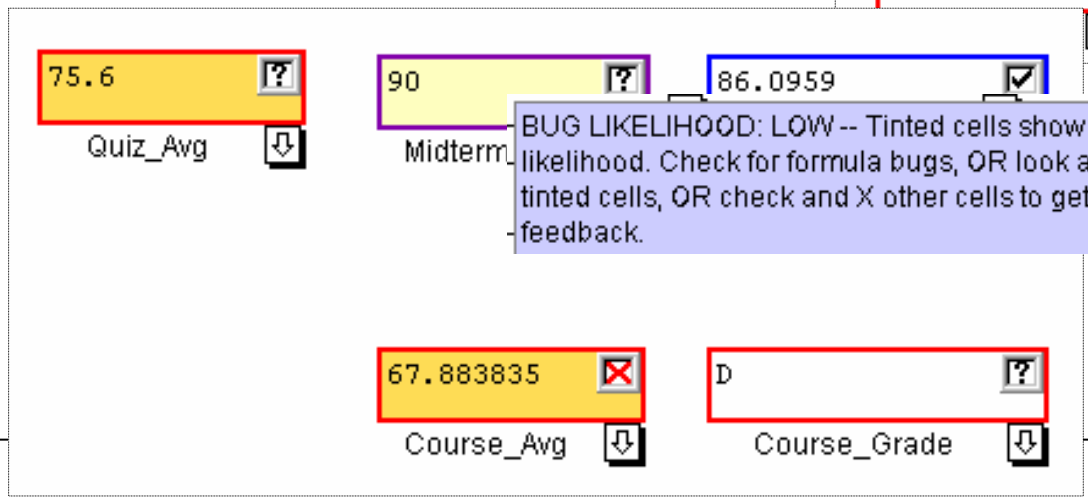
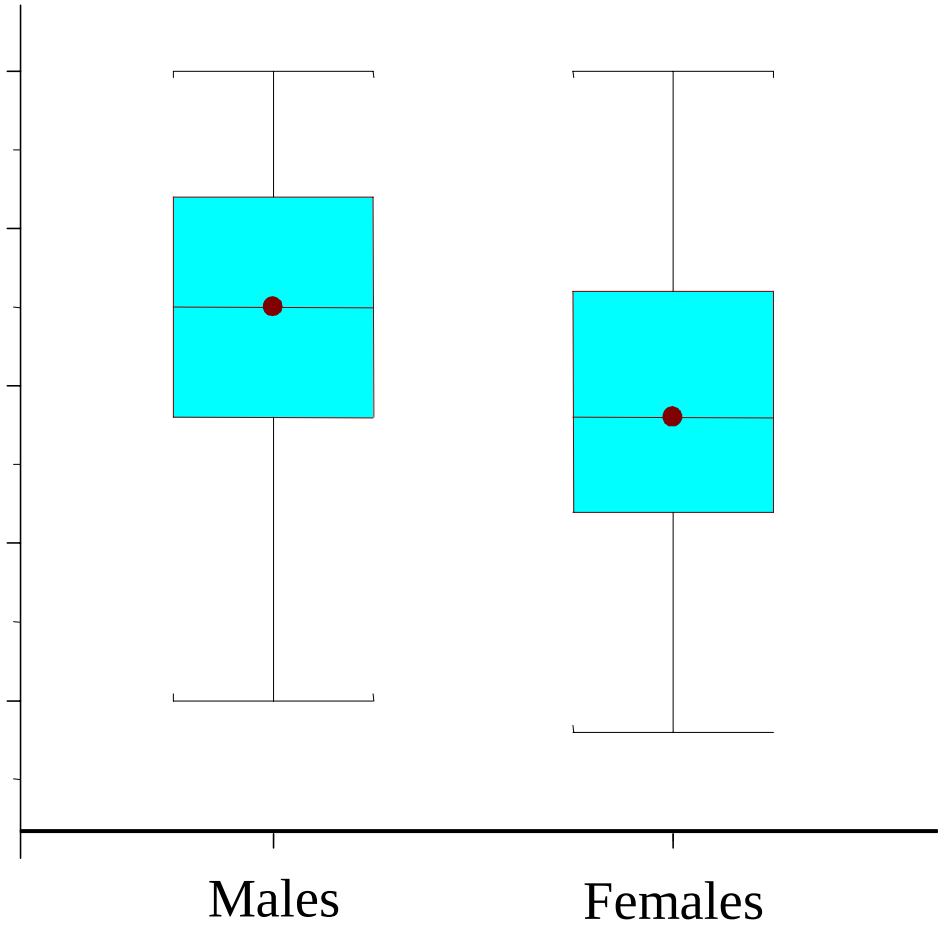
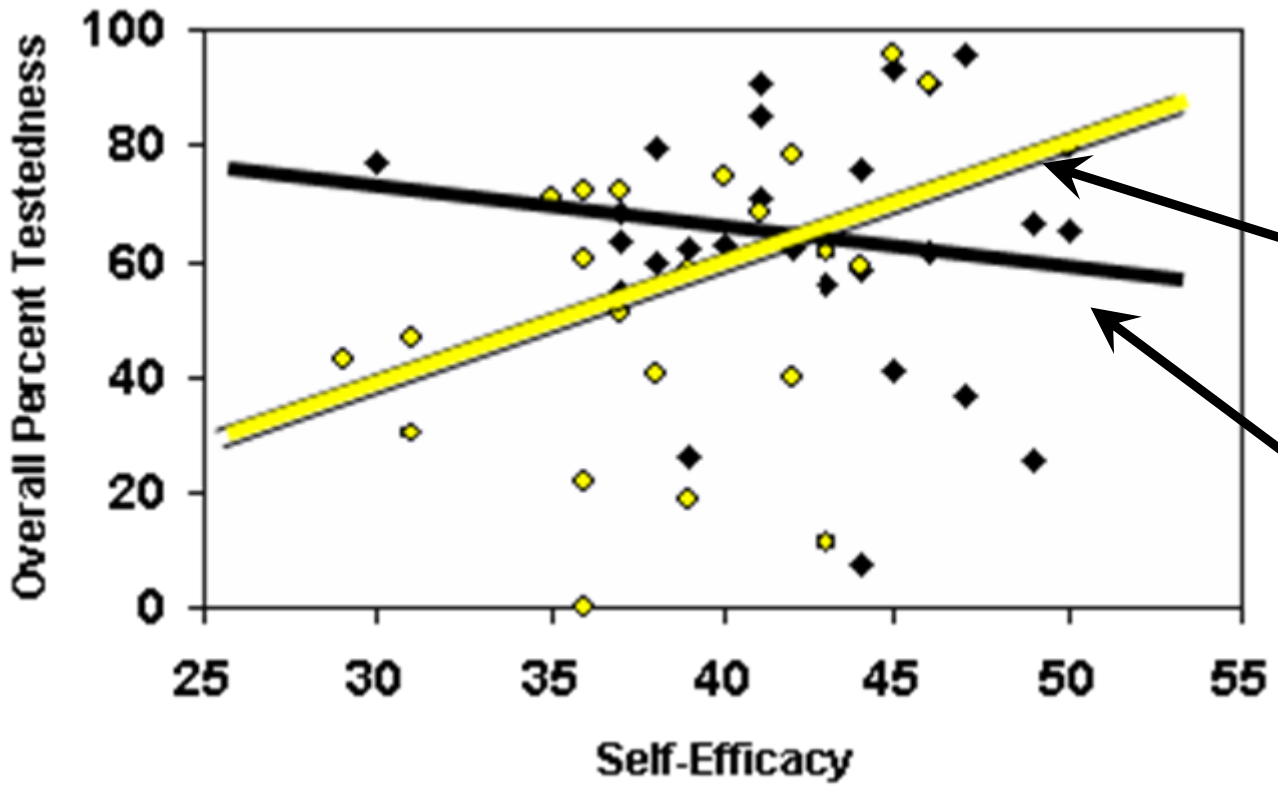




Results – Self-Efficacy (p<0.018)



Results – Self-Efficacy as Predictor (Effective) Use



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Their Goal: Find and **Fix Bugs**

Gender	Seeded Bugs Fixed	New Bugs Introduced
Males	5.815 (2.167)	.111 (.424)
Females	5.667 (2.014)	.583 (.974)

No difference
p=.651

Difference
p=.011

Results – Adoption

Gender	Familiar Features p<.03	Taught Features p<.03
Males	23.8 (9.58)	123.41 (68.27)
Females	29.8 (9.66)	87.54 (47.67)

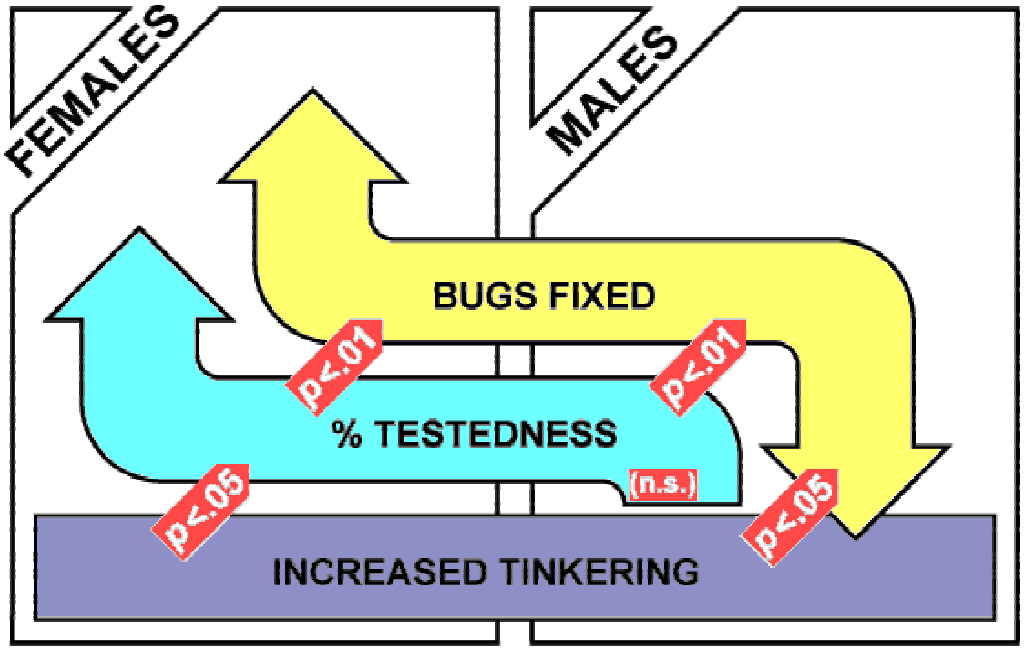
Gender p<.01	Untaught Features Used by…	Untaught Features Not Used by…
Males	22	5
Females	11	13

Tinkering (details at CHI'06)

Tinkering pausefully is good for everyone (and helps self-efficacy).

When females tinker, it's pauseful.

Males can get "addicted".



Some Emerging/Future Work

Do these results generalize?

- In progress: many additional studies, including commercial environment (Excel).

Aspects of interest/use to males/females?

- New types of built-in explanations? (Qualitative results, more work in progress)
- Features that are useful/used by just one gender?
  - Which are those? In progress: qualitative work, data mining, ...

Some Conclusions So Far

Females lower self-efficacy

- Self-efficacy predictive of effectiveness.
- Not true of males.

Females less likely to accept new features

- Opinion: too long to learn.
- But: no difference in learning!

Appear to be different features that attract males vs. females.

Tinkering: helps females. Males sometimes hurt themselves with it.